UNION OF SOUTH AFRICA
UNIE VAN SUID-AFRIKA

DEPARTMENT OF MINES — DEPARTEMENT MYNWESE

GEOLOGICAL SURVEY
GEOLOGIESE OPNAME

THE NORTHEASTERN SPRINGBOK FLATS COAL-FIELD

RECORDS OF BORE-HOLES 1 TO 27 DRILLED FOR THE DEPARTMENT OF MINES

BULLETIN 31

With notes by
H. N. Visser and S. W. van der Merwe

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DIE STEENKOOLVELD VAN DIE NOORDOOSTELIKE SPRINGBOKVLAKTE
STATE VAN BOORGATE 1 TOT 27, VIR DIE DEPARTEMENT MYNWESE
GEBOOR

Price/Prys: 9s. 3d.

The Government Printer/Die Staatsdrukker
Pretoria, 1959.

G.P.-S.6937387—1959-60—750.

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Printed by and obtainable from the Government Printer, Bosman Street, Pretoria

Gedruk deur en verkrygbaar van die Staatsdrukker, Bosmanstraat, Pretoria

DEPARTMENT OF MINES
DEPARTEMENT MYNWESE

Secretary Sekretaris	J. J. A. Nel, B.A., LL.B.

GEOLOGICAL SURVEY
GEOLOGIESE OPNAME

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Geological Map of the Northeastern Springbok Flats

Northeastern Springbok Flats; Columnar Sections: Boreholes 1 to 27.

I. - INTRODUCTION

The area concerned embraces the northeastern portion of the Springbok Flats, which is situated north of 25° latitude and east of 28°40' longitude. The major portion falls within Sheet 17 +, but part of Sheet 7 ++ is also included.

The map accompanying the bulletin was compiled partly from the above-mentioned old maps and partly from recent unpublished work. At different times during the years 1944 to 1952 the northwestern and northern edges of the Springbok Flats were mapped by D.P. van Rooyen, whose main object was to investigate the pre-Karroo formations. During 1952, 1954 and 1955 H.N. Visser surveyed the portion of the present area falling within Sheet 17 by means of aerial photographs; only the large area of Drakensberg lava between Naboomspruit, Roedtan and Immerpan was not revised. The drilling for coal took place between May 1952 and April 1957, when 27 bore-holes were completed. Two machines were used for most of the time, but in the later stages only one. A more intensive investigation of certain portions of the area with additional bore-holes is envisaged.

When these investigations commenced, the presence of coal had been reported on different occasions from various parts of the Springbok Flats, following on infor-

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+ Wagner, P.A. : Expl. Sheet 17, geol.Surv.S.Afr., 1927.

++ Kynaston, H. et al.: Expl.Sheet 7, geol.Surv.S.Afr., 1911.

mation obtained mainly from water bore-holes. It was generally held that coal would be present at depth all over the Springbok Flats except in the northwestern portion, where Stormberg rocks were known to transgress on to pre-Karroo formations. The purpose of the survey by H.N. Visser and the drilling programme was to prove the extent, quantity and quality of the coal-seams that were thought to be present in that area.

Although the results were largely negative from the economic point of view, a great deal of valuable information concerning the stratigraphy and geological structure was obtained and it was proved that two portions of the investigated area may be of potential value as coal-fields.

II. - GENERAL GEOLOGY

A. PHYSICAL FEATURES

The Springbok Flats was originally entirely overgrown by shrub-forest, but at least half of the entire area has now been cleared for the cultivation of crops.

The outstanding physical feature of the area is its entire lack of relief, except for the terrain of pre-Karroo rocks encircling the Karroo basin. The altitude ranges from about 3,000 to 3,600 feet above sea-level. Only the few inliers of pre-Karroo rocks and the Cave sandstone rise from 50 to 100 feet above the general elevation; the Cave sandstone forms a low gentle rise and a few picturesque koppies. Over the major portion of the area there is a very gentle and hardly perceptible fall in elevation towards the east.

The major portion of the area falls within the drainage-basin of the Olifants River and the rest belongs to the Nile basin. Part of the watershed is reasonably well defined, but elsewhere it is very indefinite. There are no well-developed water-courses but only laagtes along which water can run off after very heavy rains. Considered as a whole the laagtes seem to be vestiges of a former drainage-system that has passed the stage of maturity and degenerated to its present condition. The River Nile has reached such a stage of aggradation that definite water-courses no longer exist. When in flood there is a wide expanse of water with several sluggish streams. Numerous pans afford a small amount of internal drainage.

B. STRATIGRAPHY

The rocks underlying the Karroo System belong to the Waterberg, Loskop and Transvaal Systems, the Wolkberg and Godwan Formations, and various members of the Bushveld Igneous Complex. The present survey proved the presence of Loskop sediments in the Springbok Flats and several bore-holes that penetrated to the floor of the Karroo System proved that the Loskop System and the acid phase of the Bushveld Complex underlie the Karroo rocks over large areas. The floor of the Karroo basin must have had a fair amount of relief and was certainly very uneven along its edges.

Natural exposures of the Karroo rocks are very scarce, so that the subdivisions of the system cannot be mapped accurately. The correlation of the various subdivisions of the Karroo System is based solely on lithology, which means that they are only tentative as far as the Beaufort Series and the Molteno Stage are concerned.

The superficial deposits range in thickness from a mere foot or two up to 50 feet, and at one place 81 feet was recorded. As no core is usually recovered from these formations, their true thickness and nature are always somewhat problematical. The deposits concealing the Karroo rocks are mainly the following: black or chocolate-coloured turf soil on Drakensberg basalt and Karroo dolerite, white sandy soil and sand on Cave sandstone, loam ranging in colour from white to red on the other sediments. Rubble, laterite and surface-limestone occur sporadically, but the last-mentioned is fairly abundant along some laagtes, where it is associated with attapulgite. Large deposits of alluvium occur along the River Nile and some are probably also present along the main laagtes. Remnants of terrace composed of gravel and calcrete occur on Madras 566 KS. Along the large laagte in the northern part of Conterberg 665 KS pieces of Cave sandstone are found far from the nearest outcrops.

The succession of Karroo strata with their minimum and maximum thickness are given in tabular form:

Subdivisions of Karroo System	Nature of Strata	Thickness
Drakensberg Stage	Amygdaloidal and massive basalt in alternating bands; sporadic tuff and agglomerate layers; a band of fine-grained sandstone near base of lava in some localities.	1206 feet
Cave Sandstone Stage	Fine-grained, cream or pink sandstone, partly massive and partly well-bedded and cross-bedded; with minor shaly layers.	86 to 394 feet
Red Beds Stage	Siltstone, marl and mudstone with minor layers of calcareous grit and clay-pellet conglomerates, brightly coloured in purple, red, brown, greyish-green and white.	31 to 409 feet
Molteno Stage	Sandstone, partly clayey, and grit with layers of shale and mudstone.	0 to 70 feet
Beaufort Series	Red, brown and grey mudstone and shale with sporadic sandy layers; the shale is slightly ferruginous, well-bedded, hard and brownish-yellow in some instances.	30 to 126 feet
Upper Ecca Stage	Upper coal-zone consisring of black shale and coal.	0 to 50 feet
	Grey sandy shale and shaly sandstone, well-bedded and cross-bedded, with minor layers of white sandstone and poorly bedded grey shale.	95 to 190 feet
Middle Ecca Stage	Felspathic grit and sandstone, sandy shale, carbonaceous shale, conglomerate; a band of dull shaly coal and black shale is sporadically developed near the base.	0 to 137 feet
Dwyka Series	Conglomerate and, or tillite with mudstone lenses.	0 to 100 feet.

Dykes of post-Karroo dolerite are very scarce. In the southeastern portion of the area a dolerite sill is intrusive in the Karroo strata. Its attitude varies from concordant to transgressive. The sill must wedge out towards the north and west, as it has nowhere been found in bore-holes north of the railway-line between holes north of the railway-line between Naboomspruit and Zebediela nor west of a line joining Singlewood and Nutfield. Dolerite occurs below a thin cover of Ecca sediments in a well on Rustig 696 KS, east of bore-hole 22, but does not seem to occur on the surface in that vicinity. The sill seems to be present only at depth in the area between Conterberg 665 KS and Bekend 690 KR. However, it may outcrop further east within the pre-Karroo rocks and transgress stratigraphically upwards towards the northwest. The maximum thickness of the sill, as found in the bore-holes, range from 36 to 165 feet; in some instances it is split up in several portions. The dolerite is mostly medium- to coarse-grained with obvious ophitic texture, but the chill-phases are fine-grained and porphyritic. On Foleys Rust 583 KS the contact-phase is amygdaloidal. In several bore-holes the dolerite is well jointed and much altered.

C. CORRELATION

In several of the bore-holes the very basal portion of the Karroo strata, over a thickness ranging from a few inches to several feet, consists of conglomeratic rocks.

Most of the pebbles are some 2 inches in diameter, but some are up to 6 inches. They consist of Rooiberg felsite, Bushveld granite, and quartzite of the Pretoria Series, the Loskop and the Waterberg Systems, and pebbles originating from the pre-Karroo rocks in the immediate vicinity are in the majority everywhere. The matrix may be felspathic or grey and clayey and is rather similar to the adjacent sandstone and grit. Where these sediments crop out, the conglomeratic portion that may also contain angular boulders of the underlying older rocks, grades into typical Middle Ecca sandstone or grit. Unequivocal characteristics of glacial sediments were not noticed in cores or in outcrops. Thus the presence of the Dwyka Series is doubtful.

The only beds tentatively taken as Dwyka Series are 54 feet of conglomerate in bore-hole 27 on Hulpfontein 549 KS and some 100 feet of conglomerate and boulder-beds with intercalated argillaceous layers in bore-hole 24 on Welgegund 693 KS.

The sediments that belong to the Ecca Series could not be subdivided in the field, but in the bore-hole cores two main subdivisions are quite obvious. The lower portion of grit, sandstone, sandy shale and carbonaceous shale is typical of the Middle Ecca and contains local developments of coal of poor quality. These beds grade into the upper portion, which shows many points of resemblance to the Upper Ecca of both the Highveld and the coal-fields of the Northern Transvaal. Interbedded coal and carbonaceous shale was deposited in local basins at the top of the Upper Ecca Stage, which consists predominantly of well-bedded, sandy shale.

The dividing line between these two stages of the Ecca Series, as shown in the columnar sections, probably does not represent the same stratigraphic horizon in all instances.

The argillaceous sediments provisionally classified as Beaufort Series are lithologically very much like those that constitute the Beaufort Series in the Waterberg coal-field and north of the Soutpansberg. They were not deposited on the elevated portions of the pre-Karroo floor. The Beaufort beds are non-existent in bore-hole 18 on Klipput 573 KR and in bore-hole 21 on Kalkpan 683 KR, where the Molteno Stage is exceptionally thick. Where the Molteno Stage is missing, e.g. in bore-hole 17 on Kalkfontein 591 KR, it is very difficult to discern the contact between the Red Beds and the Beaufort Series. Whether the upper coal-zone of the Ecca Series is present or not, a distinct change in the type of sediment is very evident within a few feet vertically in the succession. The upper limit of the Beaufort Series shows an abrupt change from argillaceous to arenaceous sediments.

The thin but persistent zone of arenaceous sediments classed as Molteno Stage, agrees in all respects to a similar narrow zone of sandy sediments below the Red Beds in the Waterberg coal-field. These beds indicate a rise of the land-surface and a relatively short period of active erosion when sand and gravel were deposited over the Karroo landscape. A non-conformity most probably exists just below the Molteno Stage. These beds must therefore form part of the Stormberg Series and as they are lithologically quite different from those constituting the Red Beds Stage, they cannot be anything else than the Molteno Stage.

The Drakensberg basalt, the Cave sandstone and the Red Beds are identical with the corresponding rocks of other coal-fields in northern Transvaal and of the type area in the Basuto Highlands.

D. STRUCTURE

The Karroo System was deposited on a landscape of varying relief. Along the northern and northwestern edges of the original Karroo basin there must have been moderately hilly to mountainous country, as is the case today. Towards these former higher lying parts of the landscape the lower subdivisions of the Karroo System show an abnormal or abbreviated succession or were not deposited, so that various portions of the Stormberg Series show very pronounced overlap on to the pre-Karroo formations.

The Karroo rocks form two very shallow elongate basins or synclinal flexures connected by a broad, flat anticlinal flexure. These structures trend in a general northeasterly direction and are modified to a certain extent by several normal faults with approximately the same strike.

These flexures are not similar in origin to folds caused by compression. The low dip of 5° or less most probably represents the initial dip, which has been slightly augmented by sagging of the strata as they became compacted under the weight of superincumbent rocks. The sagging is naturally greatest where the Drakensberg basalt attains its maximum thickness. Tilting of strata towards faults may also account for the dip in certain areas.

The Karroo basin is limited on the north by a fault with a general trend from east-northeast to west-southwest; individual portions of it are directed at 45° to this general strike. The downthrow to the south ranges from several hundred to more than a thousand feet. It is impossible to tell to what extent drag on the downthrow side of the fault or an original southerly dip away from the higher lying pre-Karroo terrain is responsible for the presence of the Cave sandstone at or near the surface along the northern rim of the basin.

Along the southeastern edge of the Karroo basin the strata strike from southwest to northeast and dip to the northwest. On Charlottes Dale 568 KS and adjoining farms a fault with downthrow side to the northwest cuts across the regional strike of the beds at a small angle. As the downthrow of the fault increases towards the northeast the different subdivisions of the Karroo System taper out against the fault, which gives the impression of a gigantic amount of overlap. Bore-holes 7 and 9 prove conclusively that the full succession of Karroo strata is present there and superficial evidence of the fault is also found towards the northeast outside the present area.

The fault trending northeast across Klipputgat 572 KR has a downthrow of about 800 feet. It may continue east of Vogelstruispan 552 KR in the basalt. The fault separating the Cave sandstone and the Drakensberg basalt on Blinkwater 592 KR possibly continues further west than shown on the map. The trough between the last-mentioned two faults explains the westerly extension of the basalt in this part of the area.

The southern area of Drakensberg basalt is bounded on the north by a fault that has a downthrow of at least 600 feet on Smaldeel 618 KR. The sudden change in strike of this fault at some places may be either due to a pre-Karroo zone of weakness or it may indicate the point of intersection or junction of two different faults. None of these possibilities could be proved in the field.

The basalt on Verloren 622 KR is bounded on the north by a fault with a downthrow of some 350 feet. This fault must continue further east as far as Conterberg 695 KS, as its presence affords the only feasible explanation of the curious distribution of the Karroo sediments in that part of the Springbok Flats. On Verloren the fault seems to be laterally displaced at two localities. This phenomenon may be due either to minor faults younger than the main fault or it may be ascribed to the presence of several faults that do not persist along the strike for any considerable distance parallel and near to each other.

The presence of Cave sandstone in the area around bore-hole 20, between two occurrences of basalt, is most probably ascribable to a slight anticlinal flexure that is cut off on its northwestern side by a fault with its downthrow side to the southeast.

Small local faults as the one at bore-hole 22 on Bekend 690 KR, can be expected to occur all over the area especially near the large regional faults.

Strips of silicified breccia in the pre-Karroo rocks indicate faults of which the age and structural nature cannot be determined from the available evidence.

Linear features that may be dykes or faults show up on the aerial photographs of areas where the natural vegetation still existed at the time of photography. One such feature on Mabane's Location 695 KR could be located in the field. The thorn-trees are somewhat denser and bigger than usual on a narrow strip where a large amount of coarsely crystalline calcite occurs in the soil and the deeply weathered basalt. It may be a fault or just a zone of brecciation. Other similar features on the aerial photographs could not be located as cultivated fields have been made there, outcrops do not exist, or no visible difference in the soil and vegetation could be found.

III.- COAL

A. GENERAL FEATURES

The drilling program in the Springbok Flats has proved that coal is found on two different horizons in the Ecca Series. One is near the base of the Karroo System in the Middle Ecca Stage and the other one at the top of the Upper Ecca Stage. This latter coal-bearing zone corresponds very well lithologically and stratigraphically with the succession of black shale and coal-seams that is so well developed in the Waterberg and the Soutpansberg Coal-fields.

The coal-zone of the Middle Ecca is well developed only on Madras 566 KS, Charlottes Dale 568 KS, Foleys Rust 583 KR and Bouw Lust 660 KS. Its total thickness ranges from 6 feet 9 inches to 14 feet 3 inches. It is constituted of black carbonaceous shale, seams of dull shaly coal or coaly shale up to several feet in thickness, and thin layers of dull coal. This coal is of no economic value. In some other bore-holes a seam of black shale may be the equivalent of this coal-zone. On Kalkfontein 591 KR more than one layer of carbonaceous shale with stringers of bright coal are interbedded with sandstone and grit that also contain bright coal-stringers.

The coal-zone at the top of the Upper Ecca consists of carbonaceous shale with several interbedded layers and seams of coal that range in width from a few inches to several feet. Most of this coal is of a bright or bright banded type and contains a fair amount of pyrite and calcite. A large proportion of this bright coal contains fine laminae and stringers of shale and grades into shaly coal. Dull or mixed bright and dull coal was found only at a few places. The succession is divisible into portions consisting only of shale or shale with a subordinate amount of coal, and others that are comprised of coal only or of coal with lesser shale layers.

The coal-zone of the Upper Ecca is developed only in certain areas that constitute separate basins of deposition. Insufficient data prevents the correlation of the coal-seams within these separate basins. Whether it will ultimately be possible to intercorrelate the seams in different basins after intensive prospecting, is impossible to tell at present.

B. OCCURRENCE AND POTENTIALITIES

The scanty information formerly available, led to the view that the Springbok Flats constituted a potential coal-field, except for small portions around Naboomspruit, where Stormberg rocks were known to overlap onto pre-Karroo formations.

In the northeastern portion of the Springbok Flats, which is under consideration, the area underlain by Karroo rocks is 1,400 square miles in extent. The drilling proved that only two small portions of this area may be regarded as potential coal-fields. However, the available data are insufficient for the precise delineation of these areas, so that it is impossible to determine the nature of the coal-seams properly, and to calculate the reserves.

One of these portions of the area is situated around Roedtan and traversed by the railway-line to Zebediela. It is approximately 125 square miles in extent and includes the prospecting bore-holes on Hulpfontein 549 KS, Vangheining 598 KS, Hoogbult 608 KS, and Roode Kop 600 KS.

The bore-hole on Roode Kop is not only near the sub-outcrop of the coal-zone but also near the original edge of the basin of deposition.

The coal-zone ranges in thickness from 19 to 36 feet in the bore-holes, but it will peter out completely towards the rim of the basin. The depth at which the coal occurs, ranges from about 100 feet at bore-hole 3 on Roode Kop 600 KS to 1,875feet on Hulpfontein. The bore-holes on Vangheining and Hoogbult yielded the most promising results. The successions of the coal-zone intersected in these two bore-holes are very similar and suggest an easy correlation. This matter must, however, be further investigated.

In the Roedtan coal-area major faults are not known, but it must be taken into account that their presence is very difficult to detect in the large extent of Drakensberg basalt. Minor faults may affect the coal-zone. Dolerite sills seem to be absent, except along the southwest edge of this area, where a sill that may be near the coal-zone locally is known to occur.

The other coal-area extends around Nutfield on either side of the railway line to Marble Hall. It includes the prospecting bore-holes on By Zonder 621 KR, Kalkpan 683 KR, Bekend 690 KR, and Weltevrede 670 KS. The coal-zone ranges in thickness from 0.18 to 36 feet in the bore-holes, but will peter out towards the edges of the basin. The depth of the coal ranges from less that 100 feet to some 800 feet. Dolerite occurs in and near the coal-zone on Bekend 690 KR, but has not been found elsewhere in this coal-area. Small faults are known to affect the coal-zone. A major fault bounds the coal-area on the northern side.

In this area the bore-holes on Bekend 690 KR and Weltevrede 670 KS intersected very similar successions in the coal-zone. This apparently easy correlation is not evident in the other bore-holes.

The Nutfield coal-area may extend southwestwards beyond the mapped and prospected area. To the north of Tuinplaas, however, it is known that the Stormberg rocks overlie the pre-Karroo formations and no coal will be present there.

Several coal-seams were intersected on Klipput 573 KP. They are not only displaced by a major fault, but will certainly be very erratically developed, as that locality is near the edge of the original Karroo basin, where an enormous overlap of Karroo sediments on to pre-Karroo formations is known to occur. In bore-holes 16 and 19 on London 555 KR and Smaldeel 618 KR the Ecca sediments are missing, on Ceres 548 KR the coal-zone is absent, and on Kalkfontein 591 KR the coal-zone is very poorly developed.

There is hardly any possibility of finding coal in the area between Naboomspruit, Crecy, Singlewood, Doelen 327 KR and Klipfontein 322 KR, unless isolated basins are proved by more intensive drilling.

The Upper Ecca coal-zone is poorly developed in some localities in the area lying east of a line from Doornfontein 98 KS to Rooifontein 589 KS and it is very improbable that any portion of it is a potential coalfield.

C. CHEMICAL AND PHYSICAL PROPERTIES OF THE COAL[+]

[+] By S.W. van der Merwe, Fuel Research Institute of South Africa.

Details of sampling and analysis of the coal-seams are contained in tables at the end of the bore-hole records.

Cores from the major coal-seams were generally subjected to float and sink analysis at a specific gravity of 1.58 after crushing through a 1-inch square mesh screen. In the case of bore-hole 3, however, a screen size of 2 inches was employed. To obtain an indication of the effect of the size of the coal on the quality of the products obtainable on washing, the core from bore-hole 1 was firstly crushed through a 1-inch screen and washed at a specific gravity of 1.50. The resulting float and sink fractions were then crushed through a $\frac{3}{16}$ - inch screen and refloated at the same specific gravity. The cumulative values for these products are given in the table at the end of the record of bore-hole 1. In all cases the float fractions were fully analysed but only the ash contents of the sink fractions were determined.

Three areas will be discussed. They are:

(i) the coal-zone of the Middle Ecca in the east including bore-holes 7, 8, 9 and 25;

(ii) the area around Roedtan including bore-holes 1, 3, 10 and 27;

(iii) the area around Nutfield including bore-holes 20, 21, 22 and 23.

(i) The Middle Ecca Coal-zone

No coal of any value was encountered in this area. Only one sample representing an 11-inch band at 97 feet in bore-hole 25 on Bouw Lust 660 KS was taken, the remainder being considered too inferior for analysis. Even this sample was very inferior, having an ash content of 37 per cent.

(ii) The area around Roedtan.

In bore-hole 10 on Hoogbult 608 KS, the coal-zone consists of black shale with minor bright coal bands. Only two of these bands were selected for sampling. These bands were only 23 inches and 9 inches thick respectively. They were separated from each other by a 13-inch shale band. The former band included a 4-inch shale band which was excluded from the sample. The ash contents of these samples were fairly high at 22 and 28 per cent. The volatile matter contents were high at 33 and 31 per cent., but swelling properties were but feebly developed, a maximum swelling number of 2 having been obtained. In addition to being thin, the coal was encountered at a depth of over 700 feet.

In bore-hole 3 on Roode Kop 600 KS, two seams -34 and 44 inches thick and occurring at depths of 164 ft. 5 in. and 173 ft. 9 in. respectively were sampled. In contrast to the other bore-holes in this area, the coal was mainly dull in appearance. These seams had raw coal ash contents of 22 and 33 per cent. over coal thicknesses of 34 and 37 inches. A feature of this coal is the high ash content of the floated coal obtained on washing at a specific gravity of 1.58. Ash values of 21½ and 28 per cent. with corresponding calorific values of 11.2 and 10.1 lb./lb. were obtained at yields of 98 and 67 per cent. The volatile matter contents were fairly low at 21 to 22 per cent., and the coal possessed no swelling properties.

In bore-hole 27 on Hulpfontein 549 KS, two coal-seams were sampled. The upper seam consisted of bright coal with fairly well developed swelling-properties, the swelling number being 4½, but it was only 10 inches thick. In the lower seam, the section sampled was 37½ inches thick. The upper portion of the seam which was 13 inches thick had the high ash content of 38 per cent., but this is partly due to the presence of a large pyrite inclusion. The seam, as a whole, had a raw coal ash content of 23½ per cent. Washing at a specific gravity of 1.45 yielded a product of 14½ per cent. ash, 13.2 lb./lb. calorific value and 34 per cent. volatile matter content at a yield of 72 per cent. Swelling properties are well developed, the swelling number being 8, but, owing to the high volatile matter content, a fragile and fingery coke, with an ash content of over 20 per cent. would be obtained on carbonisation. These seams were encountered at depths of almost 1,900 feet.

In bore-hole 1 on Vangheining 598 KS three seams occurring between 775 and 787 feet below the surface was sampled. The two upper seams were only 8 and 19 inches thick and fairly inferior in quality with ash contents of 29 and 26½ per cent. respectively. The bottom seam was 66 inches thick, but the lower portion of 35 inches was inferior, the ash content being 36 per cent. The upper section had an ash content of 23 per cent., but is too thin to be mined by itself. Average values for the whole seam are given below:

Thickness (in.) 66

Raw coal ash (%) 29.9

Floats at 1.50 S.G. of	-1" Coal	$-\frac{3}{16}$ coal
Yield (%)	31.2	41.7
Calorific value (lb./lb)	12.4	12.8
Moisture (%)	2.1	2.1
Ash (%)	14.5	11.8
Volatile matter (%)	36.4	37.0
Fixed carbon (%)	47.0	49.1
Swelling number	4½	5½

The coal has a very high volatile matter content and well developed swelling properties but unfortunately a rather high ash content, and it is almost 800 feet below the surface. It is similar to the Waterberg bright coals in that it is interbanded with fine shale bands. A coking coal fraction of reasonably low ash content cannot be separated without recourse to fine crushing. This is evident from the above analyses, where coal crushed to -3/16 inches gave a product 2.7 per cent. lower in ash content at a 10 per cent. higher yield than coal crushed to -1 inch when washed at the same specific gravity. Even the product obtainable on washing finely crushed coal has an ash content of 11.8 per cent., so that the resultant coke will probably have an ash content of almost 20 per cent. and will be fingery and fragile owing to the high volatile matter content.

Ultimate analyses were carried out on the float fraction of the -3/16 inch coal of the upper portion of the seam. The following results were obtained:

On a dry ash-free basis:

Carbon : 81.3 per cent.

On a dry ash-free basis: (Cont.)

Hydrogen : 5.8 per cent.

On an air-dry basis:

Sulphur : 1.0 per cent.

The rank of the coal, as indicated by its dry ash-free carbon content, is very similar to that of the Waterberg bright coals. Owing to the higher volatile content, the hydrogen content is slightly higher than that of the Waterberg bright coals due to the higher volatile matter content. The sulphur content of 1 per cent. is reasonable for a coking coal.

(iii) The area around Nutfield

In bore-hole 20 on By Zonder 621 KR, one coal-seam, 80 inches thick, was sampled. The middle section of the seam was inferior, as it consisted of 15½ inches of interbanded bright coal and shale of 41 per cent. ash content and 14 inches of carbonaceous shale. The top and bottom sections were of better quality, the ash contents being 20 per cent. and 21 per cent. over 25½ and 25 inches respectively. Average values for the whole seam are given below:

Coal thickness	66"
Exclusions	14"
Raw coal ash	25.3%
Floats of -1" coal at 1.58 S.G.	
Yield	73.5
Calorific value	12.3 lb./lb.
Moisture	1.8%
Ash	17.2%
Volatile matter	35.0%
Fixed carbon	46.0%
Swelling number	5

Swelling properties are well developed but, owing to the high ash and volatile matter contents of the floated coal, a coke with an ash content well over 20 per cent. would be obtained on carbonisation. To obtain a product with a reasonable ash content, the coal would have to be crushed to a finer size and washed at a substantially lower specific gravity. This coal was encountered at a depth of almost 800 feet.

The following ultimate analysis was obtained on the float fraction of the seam:

On a dry ash-free basis:

Carbon : 82.9%
Hydrogen : 5.7%

On an air-dry basis:

Sulphur : 1.5%

The hydrogen content is slightly lower than in bore-hole 1, owing to a slightly lower volatile matter content and is associated with a somewhat higher carbon content. The fairly high ash fusion temperature of 1320°C was also obtained.

In bore-hole 21 on Kalkpan 683 KR, three seams, encountered at depths of 777, 783 and 791 feet were sampled. All three seams were thin: the coal thicknesses are 23, 33 and 20½ inches, and the ash contents were rather high at 32, 24 and 23 per cent. The swelling properties of the two lower seams are well developed, the swelling number being 4½.

Two seams were sampled in bore-hole 22 on Bekend 690 KR. These seams were only 20½ and 25½ inches thick and in addition, the lower seam was very inferior, the ash content being 37 per cent. The volatile matter contents of both seams were only 23 per cent. and the coal had no swelling properties.

One major seam of 48 inches was sampled in bore-hole 23 on Weltevrede 670 KS. It had a high ash content of 33 per cent. and even by discarding 28 per cent. on washing, the ash content could be improved to only 28 per cent. The volatile matter content of the floated coal was 28 per cent. and swelling properties were but feebly developed, swelling numbers of 2 and 2½ having been obtained.

Only one other coal occurrence was sampled, namely that in bore-hole 18 on Klipput 573 KR. Two seams were sampled, but both were very inferior, as their ash contents were 34 and 49 per cent. over coal thikknesses of 13 and 21 inches respectively.

IV. - BORE-HOLE RECORDS AND ANALYSES

BORE-HOLE 1 VANGHEINING 598 KS

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
10	6	Soil and surface-limestone		
84	11	Sandstone, fine-grained, white.		
45	4	Sandstone, fine-grained, with a few thin layers of sandy shale.	141	0
113	9	Sandstone, fine-grained, white.	254	9
4	3	Dolerite, fine-grained, greenish-black.		
63	0	Sandstone, fine-grained, white.		
12	1	Dolerite, fine-grained, greenish-black.		
3	1	Siltstone, grey to greenish-grey.	340	1
134	4	Mudstone, brown, alternating with variegated marl.	474	6
33	2	Siltstone and marl, light-grey.	507	9
18	2	Dolerite with numerous calcite veins and slickensides.		
142	8	Marl, siltstone and mudstone; white, pink, brown or variegated.	673	0
14	7	Mudstone, brown, with several sandstone layers that increase towards the base.		
12	7	Sandstone, brown at top, gritty and white towards base.	700	2
72	10	Mudstone, brown to grey, some calcareous nodules and pyrite in lower half.		
21	1	Shale, black.	775	1
0	8	Coal, bright banded, fairly pyritic; very shaly in bottom portions.	775	9
1	9	Shale, black.	777	6
1	7	Coal, bright banded, fairly pyritic and calcitic.	779	1
2	2	Shale, greyish-black.	781	3
5	3	Coal, bright banded, shaly in parts, pyritic and calcitic.	786	6
6	0	Shale, greyish-black, a few bright coal stringers; a gritty layer near bottom.	794	6
8	3	Shale, greyish-black.		
127	10	Shale, grey, mostly sandy and well-bedded, with layers of shaly sandstone.		

BORE-HOLE 1 (Cont.)

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
0	9	Grit, black shale and ¼ inch of bright coal.		
27	3	Sandstone, grey to white, partly fine-grained and clayey, and partly gritty; portions pyritiferous.	960	0
100	8	Dolerite, medium-grained, ophitic; 5 feet chill-phases, numerous joints and slickensides.	1060	8
22	3	Shale, mainly grey and sandy, with several layers of shaly sandstone or white gritty sandstone.		
7	7	Sandstone, white to grey, with grey shale partings.	1090	6
72	3	Sandstone and grit, white to grey, with clayey portions and grey shale partings.		
0	6	Shale, red.		
3	9	Conglomerate and grit.	1169	3
48	6	Quartzite, greenish-grey, and red, grey or purple shale. (Loskop System).		
2	3	Rooiberg felsite, amygdaloidal; numerous joints and quartz veinlets.	1220	0

Bore-hole 1 Vangheining 598 KS

F.R.I Sample Number		Thickness recovered	Depth		Nature of strata
		In.	Ft.	In.	
52/624	D	8	775	1	Bright banded coal, fairly pyritic. Very shaly in bottom portion.
			775	9	
			776	6	
	C	19			Bright banded coal, fairly pyritic and calcitic. Slipplane in top 3 inches.
			779	1	
			781	3	
	B	30			Bright banded coal, slightly shaly in parts, fairly calcitic, and slightly pyritic.
	A	33			Banded bright coal with some thin shale bands towards top. One 1.5 inch shale band 16 inches from bottom excluded. Fairly calcitic.
			786	6	

BORE-HOLE 1 VANGHEINING 598 KS

F.R.I. Sample Number	Thickness in.		ANALYSIS OF RAW COAL (AIR-DRY BASIS)						Size of Coal Washed	S.G.	Float Yield %	ANALYSIS OF FLOAT (AIR-DRY BASIS)						SINK	
	Exc.	Sampled	C.V. lb./lb.	H_2O %	Ash %	V.M. %	Fix. Carb. %	Sw. No.				C.V. lb./lb.	H_2O %	Ash %	V.M. %	Fix. Carb. %	Sw. No.	Yield %	Ash %
52/624D		8	–	1.9	28.9	31.4	37.8	1Ag											
C		–	–	–	–	–	–	–	-1"	1.50	21.8	–	2.2	13.4	38.1	46.3	4 *	78.2	30.1
C			–	–	–	–	–	–	-3/16"	1.50	40.7	–	2.3	12.3	39.0	47.4	5	59.3	36.2
C		19	–	–	26.5	–	–	–				13							
B			–	–	–	–	–	–	-1"	1.50	44.3	–	2.1	14.4	36.8	46.7	4½*	55.7	29.9
B			–	–	–	–	–	–	-3/16"	1.50	56.0	–	2.1	12.0	37.3	48.6	5½	44.0	37.0
B		31	–	–	23.0	–	–	–				12.8							
A			–	–	–	–	–	–	-1"	1.50	19.6	–	2.1	14.8	35.5	47.6	4½*	80.4	41.2
A			–	–	–	–	–	–	-3/16	1.50	29.1	–	2.1	11.5	36.5	49.9	5½	70.9	46.1
A		35	–	–	36.0	–	–	–				13							

Note: The coal was washed after crushing firstly to -1" and then to -3/16" in order to determine the effect of the size of the coal on the quality of the coal.

* Estimated values. These values will probably not differ by more than ½ - 1 units from the true values.

BORE-HOLE 2 CALAIS 563 KS

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
81	0	Attapulgite and surface-limestone.	81	0
28	3	Sandstone, fine-grained, with grey clayey partings in some portions.		
36	0	Basalt; alternating massive and amygdaloidal bands.	145	3
19	0	Sandstone, tuffaceous, grey; carbonaceous material at base.		
202	7	Sandstone, fine-grained cream-coloured to pink; a 3 foot grey, clayey bed at 365 feet depth.		
3	2	Sandstone with several calcareous nodules.	370	0
100	0	Siltstone with some marl, white, pink or red.	480	0
162	0	Marl, variegated, and pink siltstone.	642	0
36	6	Mudstone, red, greyish-purple or purple with white spots.		
10	0	Sandstone and grit, clayey, grading into sandy mudstone.	688	6
10	8	Grit, brown, with two shale partings.		
1	9	Sandstone, brown.	701	0
25	7	Mudstone, yellowish-brown to purple.	726	7
11	0	Shale, grey.		
69	2	Shale, grey and sandy or shale with thin sandstone layers.		
9	4	Shale, grey.	816	6
1	6	Shale, grey, with three coaly layers of 0.5 inch each.		
12	8	Shale, grey, with a sandy layer 6 feet from top.		
1	8	Shale, carbonaceous.		
3	9	Shale, grey, with sandy layers.	836	3
9	9	Bushveld granophyre.	846	0

BORE-HOLE 3 ROODE KOP 600 KS

Thickness recovered Ft.	In.	Nature of strata	Depth Ft.	In.
7	6	Soil.		
5	7	Surface-limestone.	20	0
3	5	Attapulgite.	45	6
2	0	Calcified Red Beds.	49	6
1	9	Marl, purple to red.	63	6
6	4	Sandstone and grit, brown.	73	9
61	5	Mudstone, yellow, brown, purplish-grey to grey.		
2	3	Dolerite, fine-grained, greyish-green.	145	6
16	1	Shale, black to grey.	164	5
2	10	Coal, dull with a few bright stringers; bottom 2 inches bright; pyritic towards top.	167	3
2	3	Shale, black.		
0	5	Coal.		
3	8	Shale, black to grey.	173	9
1	3	Coal, dull and shaly in top 7 inches; merging into mixed mainly dull coal towards bottom.	175	0
0	7	Shale, carbonaceous. (N.S.)		
0	8	Coal, dull, shaly.		
1	2	Coal, mixed mainly bright; shaly in places; very pyritic and calcitic.	177	5
3	8	Shale, black.	181	1
2	1	Dolerite, fine-grained.	183	2
56	0	Shale, grey and sandy; 9 inches sandstone 15 feet from top.	239	2
3	3	Dolerite.		
4	11	Shale, grey.	247	4
14	4	Dolerite, fine-grained.	262	0
1	7	Shale.		
1	5	Dolerite, fine-grained.		
85	6	Shale, grey.	350	10
15	11	Shale, brownish-grey, sandy and grey in bottom half.	366	9
163	4	Dolerite, coarse-grained and ophitic, chill-phase of 7 feet is fine-grained.	530	1
2	5	Shale, greenish-grey and partly sandy; indurated, dolerite vein in bottom portion.	532	6
22	4	Shale, grey to black and sandy, alternating with sandstone layers.	556	0
7	0	Shale, black, with some sandy portions.	563	0

BORE-HOLE 3 (Cont.).

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
4	6	Sandstone, grey and shaly, scattered small pebbles.		
9	7	Sandstone, white, coarse-grained; containing some shale streaks and small pebbles.	577	3
3	10	Shale, carbonaceous to coaly with two thin coal-layers.	581	1
2	6	Shale, black; sandy towards base.		
1	9	Sandstone, white.		
0	6	Shale, greyish-brown.		
10	2	Sandstone, shaly lenses near top and some small pebbles in lower portion.	598	9
36	5	Sandstone with scattered small pebbles , partly greenish-grey and clayey.		
1	6	Conglomerate with felsite and quartzite pebbles.		
4	1	Grit with scattered small pebbles of felsite and quartzite.	641	0

BORE-HOLE 3 ROODE KOP 600 KS

F.R. I. Sample Number		Thickness recovered	Depth		Nature of strata
		In.	Ft.	In.	
			164	5	
52/826	A	34			Dull coal with a few bright coal stringers. Bottom 2" bright coal. Pyritic towards top.
			167	3	
			173	9	
52/827	B	15			Dull shaly coal in top 7", merging into mixed mainly dull coal towards bottom. Shaly.
		7			Carbonaceous shale. Not Sampled.
	A	8			Dull shaly coal.
		14			Mixed, mainly bright coal. Shaly in places, very pyritic and calcitic.
			177	5	

BORE-HOLE 3

F.R.I. Sample Number	Thickness in.		ANALYSIS OF RAW COAL (AIR-DRY BASIS)						
	Exc.	Sam-pled	C.V. lb:/lb.	H_2O %	Ash %	V.M. %	Fix. Carb. %	Sw. No.	S Co Wa
52/826A		34	-	-	21.8	-	-	-	-
52/827B		15	-	-	30.1	-	-	-	-
	7								
A		22	-	-	35.3	-	-	-	-

ROODE KOP 600 KS

e l hed	S.G.	Float Yield %	ANALYSIS OF FLOAT (AIR-DRY BASIS)						SINK	
			C.V. lb./lb.	H_2O %	Ash %	V.M. %	Fix. Carb. %	Sw. No.	Yield %	Ash %
	1.58	97.8	11.2	2.9	21.5	20.9	54.7	P	2.2	35.0
	1.58	85.2	10.0	2.9	29.0	21.5	46.6	P	14.8	36.1
	1.58	54.3	10.3	2.6	26.6	22.6	48.2	P	45.7	45.6

BORE-HOLE 4 SINGAPORE 585 KS

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
30	0	Soil and soft decomposed Red Beds.		
36	3	Siltstone and mudstone alternating, scattered calcareous nodules, mainly red; calcite vein between 10 and 19 feet from bottom.		
159	0	Marl and mudstone alternating, brown to purple with white spots in portions.		
15	6	Siltstone, greyish-purple and banded, scattered calcareous nodules, partly well-bedded.		
12	0	Mudstone, brown or purple with white spots.	261	0
61	4	Mudstone and marl alternating, brown to purple or mottled.	323	3
18	8	Marl, purple with white spots, 6 inches of cross-bedded clay-pellet conglomerate at base.	342	3
5	7	Mudstone, greyish-purple.	348	3
15	6	Grit with scattered small pebbles and some mudstone lenses.	363	9
49	3	Mudstone with shale near bottom, yellow, grey, brown or greyish-purple.	413	0
7	3	Shale, greyish-black.		
35	8	Shale, sandy, and shaly sandstone, grey, well-bedded, cross-bedding in parts; lenticles of coarse-grained sandstone interbedded.		
0	2	Shale, grey.		
51	11	Shale, sandy, and shaly sandstone, grey, well-bedded; grades into poorly bedded greywacke; coarse-grained sandstone lenticles interbedded.	508	0
4	1	Sandstone, clayey, grey, poorly bedded.		
1	11	Shale, sandy and grey, interbedded layers of black shale and shaly sandstone.		
3	3	Shale, greyish-black.	517	3
3	3	Shale, greyish-black.		
1	10	Shale, coaly with calcite, sandy lense in top portion.		

BORE-HOLE 4 (Cont.)

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
20	7	Shale, black to dark grey, poorly bedded.	543	2
22	4	Shale, sandy and grey; several coaly streaks in upper portion.	565	6
5	4	Sandstone, indurated; alternating shaly and coarse-grained portions; scattered small pebbles of granophyric granite.	571	0
35	7	Dolerite, coarse-grained and ophitic with fine-grained chill-phases of a few feet thick.	606	7
3	8	Shale, grey, and shaly sandstone, indurated.		
6	3	Sandstone, indurated.		
4	3	Dolerite, fine-grained; calcite and chlorite in joints.		
13	8	Sandstone, white, indurated, coarse-grained but partly clayey.		
3	0	Dolerite, fine-grained, well-jointed.	637	6

BORE-HOLE 5 SCHUILPLAATS 596 KS

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
1	0	Soil.		
2	0	Surface-limestone.		
13	0	Mudstone, red.	16	9
27	6	Marl, purple to red.	47	3
55	10	Marl and mudstone alternating, red; quartz crystals in fissure at bottom.	115	0
12	0	Mudstone, purple with white spots.	127	0
24	9	Mudstone and well-bedded siltstone, purple; some calcareous nodules in bottom portion.		
4	0	Siltstone, greyish-purple to pink, partly well-bedded.		
36	2	Mudstone and marl alternating, brown with purple layers.	193	0

BORE-HOLE 5 (Cont.)

Thickness recovered Ft.	In.	Nature of strata	Depth Ft.	In.
3	3	Siltstone, brown, well-bedded, cross-bedded in parts.		
8	0	Mudstone, brown, mottled in parts.		
6	6	Siltstone, white, brown or banded, partly cross-bedded.		
6	4	Siltstone, sandstone and clay-pellet conglomerate alternating, brown; portions are well-bedded.	217	4
31	0	Mudstone, greyish-purple and partly mottled, scattered calcareous nodules.	250	1
7	4	Sandstone with gritty portions, white to grey or brown; mudstone lenses in upper half.		
1	0	Grit, brown, with a few small angular pebbles.		
0	3	Shale, brown, hard.		
6	9	Grit, light brown or white, with scattered pebbles.	265	8
43	9	Mudstone, grey to greyish-purple.	309	5
8	7	Shale, black.	318	0
4	0	Sandstone, shaly, thinly bedded.	322	0

BORE-HOLE 6 ROOIFONTEIN 589 KS

Thickness recovered Ft.	In.	Nature of strata	Depth Ft.	In.
26	9	Soil and surface-limestone.		
10	2	Grit and sandstone, white.	37	0
44	0	Mudstone, purple to grey.		
4	0	Shale, grey; a 9 inch black layer 3 feet from bottom.		
5	6	Sandstone, buff, fine-grained.		
13	0	Sandstone, shaly and grey, cross-bedded.		
0	7	Shale, black.		
4	0	Sandstone, shaly and grey, well-bedded.		
12	0	Shale, partly sandy, grey to light purplish.		
60	0	Shale, sandy and grey, poorly to well-bedded.	196	9

BORE-HOLE 6 (Cont.)

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
15	6	Shale, slightly sandy, grey, black layers in lower 18 inches.		
42	4	Shale, dark grey; 4 inches shaly sandstone 3 feet from bottom.		
12	11	Shale and shaly sandstone, grey.	267	8
13	10	Sandstone, white, indurated.		
0	7	Shale, sandy, grey, indurated.		
131	4	Dolerite, coarse-grained and ophitic; fine-grained chill-phases of 10 and 13.5 feet respectively at top and bottom.	413	6
10	7	Sandstone, grey and indurated; lenses of greenish-grey shale in upper portion.	424	1
0	3	Granite pebble in sandstone matrix.		
7	3	Bushveld granite, coarse-grained, pale red.	431	7

BORE-HOLE 7 CHARLOTTES DALE 568 KS

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
3	0	Surface-limestone.		
24	0	Attapulgite and surface-limestone.	27	0
1	0	Grit, red.		
26	1	Mudstone; red, pink or grey.		
2	3	Shale, grey.		
71	5	Shale, grey and sandy, well-bedded, with numerous layers of shaly sandstone; coarse-grained sandstone and coaly shale layers at base.		
3	6	Sandstone, clayey, with coarse-grained layers.	165	0
69	2	Dolerite, numerous joints.		
8	7	Sandstone, indurated, fine to coarse-grained.	262	6
44	9	Sandstone, medium to coarse-grained, felspathic, white to grey; shaly partings; scattered small pebbles in one band below the middle.	309	0
7	3	Shale, coaly, with bright coal-stringers.	316	3

BORE-HOLE 7 (Cont.)

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
1	1	Shale, grey, with sandy lenses.	317	4
1	0	Coal-stringers, bright, in carbonaceous shale.	318	4
1	0	Shale, black; two sandy partings near base.	319	4
2	4	Sandstone, coarse-grained, light grey.		
4	0	Conglomerate and grit.		
1	3	Sandstone, grey, medium-grained.		
1	10	Conglomerate.		
0	3	Shale, sandy.		
1	10	Sandstone, coarse-grained.		
0	7	Shale, sandy.		
7	10	Conglomerate with grey, clayey sandstone lenses; big quartzite pebble.	342	8
1	4	Conglomerate with granite and quartzite pebbles.		
5	0	Bushveld granite, pink, coarse-grained.	349	0

BORE-HOLE 8 FOLEYS RUST 583 KS

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
2	0	Soil.		
19	0	Surface-limestone.	21	0
12	0	Sandstone, white, medium-grained; with a 3-inch ferruginous grit layer.		
4	8	Shale, sandy; with grit partings.		
9	11	Sandstone, coarse-grained, with interbedded shale layers.	53	7
131	10	Dolerite, coarse-grained, ophitic; numerous joints filled with chlorite; chill-phases contain calcite amygdales.	185	5
8	10	Grit, with scattered small pebbles, greyish-white.	194	5
0	7	Shale, coaly.		
4	4	Sandstone, coarse-grained, grey.	199	6
3	0	Shale, coaly, with bright coal-stringers.		
2	10	Shale, coaly, pyrite in upper portion.		

BORE-HOLE 8 (Cont.)

Thickness recovered Ft.	In.	Nature of strata	Depth Ft.	In.
0	11	Shale, carbonaceous.		
2	4	Shale, greyish-black, sandy in top half.	209	6
4	2	Sandstone, coarse-grained, grey.		
0	10	Shale, carbonaceous.		
1	0	Sandstone, coarse-grained, grey.	215	6

BORE-HOLE 9 MADRAS 566 KS

Thickness recovered Ft.	In.	Nature of strata	Depth Ft.	In.
10	0	Soil.	10	0
81	6	Mudstone with interbedded marl, brown or mottled.		
42	11	Marl, brown; some mudstone at base.	151	0
22	7	Marl and mudstone, brown or mottled; brown to purple well-bedded siltstone layers with a few calcareous nodules.	173	9
11	4	Siltstone, light brown to purplish, with scattered calcareous nodules; partly well-bedded.		
7	1	Sandstone, fine-grained, with layers of grit, and clay-pellet conglomerates; purplish to light brown.	192	2
6	0	Mudstone, mottled purple and brown.		
4	2	Siltstone, greyish-purple.		
14	6	Mudstone, brown or mottled, with some calcareous nodules, clay-pellet conglomerate and a cherty layer.	218	3
26	10	Mudstone, brown to purplish, with hard chertly layers.	248	0
3	0	Mudstone, purplish to light brown.	251	0
5	3	Sandstone, clayey, brown to purplish, grades into grit at bottom.	256	3
43	6	Shale and mudstone, grey, yellow, brown or purple, some hard layers, a few calcareous nodules.		
8	4	Shale, grey, slightly sandy.		
38	5	Shale, grey and sandy, with shaly sandstone layers.	348	3

BORE-HOLE 9 (Cont.)

Thickness recovered Ft.	In.	Nature of strata	Depth Ft.	In.
66	4	Shale, grey, sandy.	414	11
0	11	Shale, coaly.		
35	4	Shale, black or grey, partly sandy.		
5	6	Sandstone, clayey, with black shale lenses.	457	10
59	5	Dolerite, medium-grained and ophitic, with fine-grained chill-phases; joints filled with serpentine and chlorite.	517	3
2	6	Shale, grey, sandy.		
22	4	Sandstone, with gritty and shaly portions.	545	0
5	6	Sandstone, shaly, with 3 inches conglomerate at base.		
2	3	Shale, carbonaceous.		
3	0	Shale, coaly, with bright coal-stringers.		
0	3	Shale, grey and sandy.		
0	10	Shale, carbonaceous.		
2	2	Shale, coaly, with bright coal-stringers.		
4	4	Shale, carbonaceous.	563	4
5	1	Sandstone, shaly at top, rest coarse-grained.	568	5

BORE-HOLE 10 HOOGBULT 608 KS

Thickness recovered Ft.	In.	Nature of strata	Depth Ft.	In.
16		Soil and surface-limestone.	16	0
261		Cave sandstone, light brown and fine-grained; a clayey layer at 56 feet depth; some calcareous nodules at 217 feet depth.	277	8
28	8	Siltstone and marl, brown, purple or mottled.	306	5
67	7	Mudstone and marl alternating, brown.		
20	4	Siltstone, white, reddish, or purple.	394	4
134	9	Marl and mudstone, brown or mottled.	529	7
3	7	Mudstone with layers of clay-pellet conglomerate, grit, and sandy shale.		

BORE-HOLE 10 (Cont.)

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
63	4	Mudstone and siltstone, purplish, scattered calcareous nodules.	598	0
30	9	Mudstone with marl layers, purple to brown.		
32	7	Sandstone, fine to coarse-grained, with gritty and shaly layers; greyish-white to purplish.	662	8
3	7	Mudstone with gritty portions, brown. Fault-plane at an angle across core.		
5	10	Mudstone with scattered quartz grains, grey to brown.		
15	8	Shale, grey or brown, partly sandy.	695	6
6	5	Shale, carbonaceous.	701	11
0	4	Coal, bright, with many thin shale bands, very pyritic. N.S.		
0	9	Shale, carbonaceous.		
0	4	Coal, bright, and carbonaceous shale bands of ± ½ inch. N.S.		
1	3½	Shale, carbonaceous.		
0	7½	Coal, bright banded, very shaly. N.S.		
0	5	Shale, carbonaceous.		
0	5	Coal and shale. N.S.	706	1
4	0	Shale and some shaly coal, pyritic.	710	1
0	10	Coal, bright banded, calcitic in top ½ inch.		
0	4	Shale.		
0	9	Coal, bright banded, granular, very pyritic, slightly calcitic.	712	0
1	1	Shale, black.	713	1
0	9	Coal, bright banded, pyritic, shaly and calcitic.	713	10
1	0	Shale, coaly, pyrite in basal portion.	714	10
49	11	Shale, sandy and grey, with layers of grey or white shaly sandstone.	764	9
87	3	Shale, grey and sandy, partly cross-bedded, lenses and layers of sandstone.	852	0
20	0	Shale, grey and sandy, with sandstone and grit layers.		
24	9	Sandstone with shale, grit and conglomerate layers.	896	9
15	6	Shale, red, alternating with reddish-grey quartzite (Loskop System).	912	3

BORE-HOLE 10 HOOGBULT 608 KS

F.R.I. Sample Number		Thickness recovered	Depth		Nature of strata
		In.	Ft.	In.	
			701	10	
		1			Carbonaceous shale. Not sampled.
		4			Bright coal, with many thin shale bands. Very pyritic. Not sampled.
		2			Carbonaceous shale. Not sampled.
		7			Shale. Not sampled.
		4			Bright coal, and carbonaceous shale bands, approximately ½" thick. Not sampled.
		12½			Shale. Not sampled.
		3			Carbonaceous shale. Not sampled.
		7½			Banded bright coal, very shaly. Not sampled.
		5			Carbonaceous shale. Not sampled.
		5			Coal and shale. Not sampled.
			706	1	
			710	1	
53/307	A	10			Banded bright coal, calcitic in top ½".
		4			Shale. Not sampled.
		9			Banded bright coal, granular, very pyritic, slightly calcitic.
			712	0	
			713	1	
53/308	A	9			Banded bright coal, pyritic, shaly and calcitic.
			713	10	

BORE-HOLE 10 HOOGBULT 608 KS

F.R.I. Sample Number	Thickness in.		ANALYSIS OF RAW COAL (AIR-DRY BASIS)					
	Exc.	Sampled	C.V. lb./lb.	H_2O %	Ash %	V.M. %	Fix.Carb. %	Sw. No.
53/306	51				No	samples		
53/307 A	4	19	10.9	2.2	22.1	33.0	42.7	2
53/308 A		9	10.2	2.0	28.1	31.1	38.8	1½

BORE-HOLE 11 ZEBEDIELA ESTATES 101 KS

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
0	0	Soil.	4	0
7	0	Rubble of quartzite, hornfels and diabase boulders.		
1	0	Tuff.		
21	0	Sandstone, white, fine-grained.	106	0
2	0	Tuff.		
30	0	Basalt, decomposed.		
6	0	Lava, amygdaloidal.		
156	0	Sandstone, fine-grained, white.		
6	0	Sedimentary breccia.	340	11
8	0	Mudstone with thin sandstone layers.		
21	0	Mudstone, red.	372	0
4	0	Shale.		
3	0	Sandstone, brown.		
4	0	Grit.	386	4
34	0	Shale, blue.		
0	7	Coal, dull.		
3	0	Shale, blue.		
7	0	Grit, grey.		
67	0	Shale.		
9	0	Shale, blue.	510	0
4	0	Shale and quartzite in thin alternating layers; dip of 40° (Transvaal System).		
26	0	Quartzite and chert in alternating layers; small slickensides (Transvaal System).	562	0

BORE-HOLE 12 DOELEN 327 KR

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
0	0	Soil	2	0
0	0	Gravel.	7	6
52	0	Basalt, weathered.	62	7
4	0	Basalt, porphyritic.		
720	0	Basalt; twenty amygdaloidal bands.	795	0
2	0	Shale, carbonaceous, black.		
50	0	Basalt.	847	0
0	4	Shale, carbonaceous, black.		
63	0	Basalt.	910	6
18	0	Sandstone, indurated.		
168	0	Sandstone.	1096	6
122	6	Mudstone, red.	1219	0
10	0	Sandstone (Bore-hole caved in and was stopped)	1229	0

BORE-HOLE 13 DOORNFONTEIN 98 KS

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
8	0	Rubble of Timeball Hill quartzite.	30	0
90	0	Basalt, weathered.		
224	0	Basalt, partly amygdaloidal.		
3	10	Basalt, decomposed.		
2	6	Basalt, fresh.		
2	8	Basalt, decomposed.		
7	2	Basalt.	384	10
3	9	Tuff, brecciated, with zeolite and calcite veins.		
249	0	Basalt.	637	8
271	3	Sandstone, fine-grained, white.		
0	6	Shale.		
22	9	Sandstone.	942	3
1	6	Sedimentary breccia.		
33	0	Mudstone, red.	977	9
0	9	Clay-pellet conglomerate and clayey sandstone.		
1	1	Sandstone, clayey.	1089	3
3	11	Sandstone; lower half conglomerate with quartzite pebbles.		
16	3	Shale.	1109	6
2	0	Mudstone with sandy layers containing pebbles.		
8	4	Mudstone; large slickensides filled with calcite.		
10	0	Shale, yellow, well-bedded. Dip 15°.	1129	10
12	6	Shale; lower portion sandy.		
0	4	Sedimentary breccia.	1142	10
2	0	Timeball Hill quartzite.	1144	10

BORE-HOLE 14 KLIPFONTEIN 322 KR

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
9	0	Ferricrete and weathered basalt	52	0
30		Basalt, weathered.	88	0
170		Basalt.		
5	4	Volcanic breccia.		
27	0	Basalt.	292	9
3	0	Sandstone with unevenly distributed carbonaceous material grading into basalt.		
7	0	Sandstone, dull, fine-grained, containing carbonaceous material.		

BORE-HOLE 14 (Cont.)

Thickness recovered Ft.	In.	Nature of strata	Depth Ft.	In.
1	0	Sandstone, coarse-grained.		
140	0	Sandstone, white, fine-grained.		
3	0	Sedimentary breccia.	452	6
30	0	Mudstone, red.	583	0
143	0	Mudstone.		
6	0	Shale.		
3	4	Shale, carbonaceous.	736	4
17	8	Bushveld granite.	754	0

BORE-HOLE 15 CERES 548 KR

Thickness recovered Ft.	In.	Nature of strata	Depth Ft.	In.
2	0	Soil.		
10	0	Gravel and weathered basalt.	12	6
98	7	Basalt, amygdaloidal and massive in alternating bands 2 to 15 feet thick.	115	6
0	6	Lava, badly decomposed.		
83	5	Basalt, amygdaloidal and massive in alternating band 10 to 40 feet thick.	199	5
8	9	Basalt with scattered amygdales, soft; joints filled with zeolite and calcite.		
168	3	Basalt, amygdaloidal and massive in alternating bands 4 to 40 feet thick.	381	6
393	9	Sandstone, fine-grained, light brown, with numerous small concretions. At 758 feet depth is a 5 feet badly brecciated zone.	775	3
59	2	Siltstone, pink to purplish, partly well-bedded, banded in parts; mudstone and marl layers interbedded.	835	3
111	0	Mudstone and marl in alternating bands; mainly brown with some variegated and banded portions, a few well-bedded layers.	950	0
68	7	Mudstone with subordinate marl layers, purplish to brown, banded in parts and portions variegated.	1045	0
2	9	Grit and sandstone, brown, clayey.	1048	0

BORE-HOLE 15 (Cont.)

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
43	10	Mudstone, brown to purplish with yellow spots but grey to greenish-grey in basal portion; calcareous nodules in upper few feet.		
129	11	Shale, grey and sandy, with layers of shaly sandstone.	1238	0
24	8	Sandstone, shaly, gritty in parts, grey.	1262	8
1	8	Grit with small scattered pebbles, grey.		
4	4	Shale, red, with greyish-white sandy layers. Dip 45°. (Loskop System).	1269	0

BORE-HOLE 16 LONDON 555 KR

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
3	0	Soil.		
10	0	Gravel.		
22	0	Basalt, weathered.	35	0
43	7	Basalt.		
392	11	Sandstone, upper portion white, becomes pink downwards	471	6
28	6	Mudstone.		
1	6	Sedimentary breccia.	502	1
17	0	Rooiberg felsite, red, decomposed.	520	9
42	0	Rooiberg felsite, porphyritic; quartz and felspar phenocrysts.	562	10

BORE-HOLE 17 KALKFONTEIN 591 KR

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
15	0	Sand, soil and weathered sandstone.	15	0
214	7	Sandstone, fine-grained, white or pink, partings of soft sandy shale at 39, 62 and 229.5 feet depths.	229	7
66	7	Sandstone, fine-grained, white or pink. Hard silicified portions at several depths; cross-bedded at 260 feet depth.	296	2

BORE-HOLE 17 (Cont.)

Thickness recovered Ft.	In.	Nature of strata	Depth Ft.	In.
56	11	Sandstone, fine-grained, mainly pink, some calcareous nodules in parts; mudstone partings near base.	353	2
12	8	Siltstone, white, pink or brownish. partly well-bedded.		
54	8	Siltstone and mudstone alternating, mainly brown, a few calcareous nodules in parts.	420	6
21	5	Mudstone, siltstone and marl alternating, pink to brown.		
87	5	Mudstone and marl, brown to purple.	533	0
22	5	Mudstone with some cherty portions and marl layers, brown, white and purple.	565	0
66	1	Mudstone, purplish, grey or brown.	632	7
8	3	Shale, grey with yellow and purple bands.	640	10
7	2	Shale, sandy and grey with gritty partings; bright coal-stringers in places.		
3	5	Shale, black, partly coaly and partly sandy, bright coal-stringers in top portion.		
43	7	Shale, grey and sandy, with shaly sandstone layers.		
0	10	Shale with calcite.		
7	6	Shale, grey, slightly sandy, bright coal-stringer in top portion.	703	7
90	11	Shale, grey and sandy, sandstone and grit layers in bottom portion.	795	2
25	1	Sandstone and grit alternating, with grey shale partings.		
5	1	Sandstone and grit with scattered pebbles; partings of sandy shale; stringers of bright coal; pyrite at top.		
3	3	Shale, carbonaceous and partly coaly; sandy portions; bright coal-stringers.		
6	2	Grit, conglomerate and sandy grey shale in alternating layers; carbonaceous near base; bright coal-stringers at three places.		

BORE-HOLE 17 (Cont.)

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
5	1	Shale, partly coaly with stringers of bright coal, and partly grey.	840	0

BORE-HOLE 18 KLIPPUT 573 KR

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
20	0	Sand and soil.		
17		Basalt, weathered.	37	0
24	6	Basalt, mainly massive with some amygdaloidal bands.	90	6
64	0	Basalt, massive, decomposed along master-joints in lower half.		
2	0	Basalt, badly decomposed.	157	0
1	2	Sandstone, purplish, decomposed.		
247	0	Sandstone, fine-grained, mainly pink, numerous small concretions in some zones; brecciated at 200, 235 and 266 feet depths.	406	0
10	6	Sandstone, pink, lower portion grades into siltstone.		
21	3	Marl and pink siltstone alternating.		
100	10	Mudstone, red, with marl layers.	546	0
32		Mudstone, red or purple; grades into clayey sandstone and clay-pellet conglomerate at base.	584	5
8	2	Mudstone, purple, partly sandy, hard and cherty.		
32	9	Mudstone, brown to purplish; layers of marl and clay-pellet conglomerate near base.		
14	6	Siltstone, purplish to brown, mudstone partings in basal portion.	639	10
43	0	Sandstone and grit containing angular pieces of brown mudstone; white, pink and brown.		
14	0	Sandstone, fine to medium-grained, white and brown.		
10	8	Conglomerate and grit with a sandstone layer in the middle.	707	6

BORE-HOLE 18 (Cont.)

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
2	2	Shale, grey, gritty portion in middle.		
3	4	Shale, carbonaceous and pyritic with bright coal-stringers.		
3	6	Shale, greyish-black, with coal-lens 1 foot from base. Scattered pebbles in bottom 9 inches.		
8	4	Shale, carbonaceous, with layers of shaly coal and bright coal-stringers.	727	10
0	3	Coal, dull, with numerous thin bright coal-stringers.		
0	6	Coal, shaly and bright layers alternating.		
0	4	Shale, carbonaceous.		
0	3	Coal, dull, shaly in parts.		
0	1	Coal, bright.	729	3
6	7	Shale, greyish-black.		
1	3	Shale, carbonaceous with coal-layers.		
3	3	Shale, grey, sandy.		
0	4	Shale, grey with bright coal-stringers.		
5	4	Shale, grey, sandy, gritty portions near top.		
0	10	Shale, greyish-black, with bright coal-stringers.	751	1
0	6	Coal, shaly, with a few bright coal-stringers.		
0	3	Coal, dull, very pyritic.		
1	0	Coal, shaly, dull.	752	10
2	8	Shale, greyish-black, with coal-stringers.		
4	8	Shale, sandy and grey, with gritty portions.		
0	3	Coal and pyrite.		
1	3	Shale, grey and sandy.		
1	0	Coal, shale and pyrite.		
12	0	Shale, grey, sandy.	775	3
5	0	Shale, carbonaceous, with coal-stringers.		
3	6	Shale, greyish-black, coaly near bottom; gritty parting near base.	785	4
3	8	Grit with a carbonaceous matrix and coaly shale partings near top.	789	0

BORE-HOLE 18 (Cont.)

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
0	4	Shale, carbonaceous, with coal-stringers.	789	4
3	0	Quartzite, red, well-bedded, fine to medium-grained. Cracks in upper 6 inches filled with carbonaceous material (Loskop System).	792	4

BORE-HOLE 18 KLIPPUT 573 KR

F.R.I. Sample Number		Thickness recovered	Depth		Nature of strata
		In.	Ft.	In.	
			727	10	
54/616	B	3			Dull coal with numerous thin bright coal stringers.
		6			Alternating bands of shaly coal and bright coal.
		4			Carbonaceous shale. Excluded.
		3			Dull coal, shaly in parts.
		1			Bright coal.
			729	3	
			751	1	
	A	6			Shaly coal with a few thin bright coal stringers.
		3			Dull coal, very pyritic.
		12			Dull shaly coal.
			752	10	

BORE-HOLE 18

F.R.I. Sample Number	Thickness in.		ANALYSIS OF RAW COAL (AIR-DRY BASIS)						Si c Co Wa
	Exc.	Sampled	C.V. lb./lb.	H_2O %	Ash %	V.M. %	Fix. Carb. %	Sw. No.	
54/616B	4	13	-	-	34.4	-	-	-	
A		21	-	-	48.8	-	-	-	

KLIPPUT 573 KR

			ANALYSIS OF FLOAT (AIR-DRY BASIS)						SINK	
ed	S.G.	Float Yield %	C.V. lb./lb.	H_2O %	Ash %	V.M. %	Fix. Carb. %	Sw. No.	Yield %	Ash %
	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-

BORE-HOLE 19 SMALDEEL 618 KR

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
26		Soil and sand.	26	0
30	0	Siltstone with interbedded marl layers; pink, cross-bedded in parts.		
1	1	Sandstone, white, hard.		
2	9	Siltstone, pink, well-bedded.		
3	6	Sandstone, fine to medium-grained, white to pink, clay-pellets in some parts.		
0	7	Marl, purple.		
14	8	Sandstone, fine to medium-grained, pink to white, with scattered calcareous nodules.		
8	2	Siltstone, pink, with dark red clay-pellets.		
2	8	Siltstone, white, cherty.		
33	9	Siltstone and mudstone with thin layers of marl, variegated in red and greenish-grey.	130	0
30	3	Mudstone with some marl bands, brown.		
3	7	Mudstone containing angular pieces of Loskop quartzite.		
34	6	Mudstone, reddish-brown to purple, with scattered calcareous nodules.	210	0
8	0	Sedimentary breccia (quartzite chips in a red mudstone matrix).	218	0
6	6	Sandstone, red, clayey, coarse-grained at top, finer and well-bedded at base.	224	6
10	0	Quartzite, medium-grained with shale partings, brown, well-bedded. Loskop System.		
0	4	Conglomerate (quartzite and felsite pebbles in quartzite matrix).		
10	2	Quartzite, brown, well-bedded, gritty at top, shaly layer near base.		
			245	0

BORE-HOLE 20 BY ZONDER 621 KR

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
45	0	Soil and weathered basalt.	45	0
12	6	Basalt, weathered, massive and amygdaloidal.	68	0
306	0	Sandstone, white or pink; scattered calcareous nodules in lower 70 feet; a 20 foot band below 336 feet is well bedded; a few layers and partings of sandy shale at various depths.	374	0
9	0	Sandstone, clayey, white to purplish; with some small calcareous nodules.	383	0
6	0	Marl, variegated.		
22	4	Siltstone with some marl layers near base; white, brown or purple.		
13	6	Mudstone, brown.		
34	0	Marl, variegated.		
35	10	Siltstone and marl alternating, white to purple.		
28	1	Mudstone, brown.		
41	4	Siltstone with 5 feet marl in middle, pink to purple.		
21	0	Mudstone and marl with well-bedded layers.		
17	8	Siltstone, banded, and shale; purple to white.	603	4
41	4	Siltstone with several layers of clay-pellet conglomerate; mudstone and grit partings.		
10	4	Clay-pellet conglomerate and grit with interbedded laminated sandstone.		
59	4	Mudstone, purple to brown, grading into shale at base.	718	0
0	9	Clay-pellet conglomerate.		
43	5	Mudstone, brown to purple, with hard grey cherty bands at top and bottom.		
19	0	Mudstone with layers of grey shale.	781	2
8	10	Shale, carbonaceous; with pyrite and coal-stringers.	790	0
0	5½	Coal, bright, pyritic and calcitic.		
0	0½	Shale.		
1	7½	Coal, bright, calcitic, with a few thin shale bands; ¾ inch shale ¾ inch from bottom.		

BORE-HOLE 20 (Cont.)

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
0	3½	Shale with bright coal-stringers.		
0	4	Coal, bright, calcitic.		
0	3	Shale with coal-stringers.		
0	2	Shale and coal.		
0	3	Coal, bright, calcitic and slightly pyritic.		
1	2	Shale, black, with a few thin coal-bands in top 5 inches; containing a few scattered quartz grains (N.S.)		
0	6½	Coal, finely bright banded.		
	½	Coal and calcite interbanded.		
0	6	Coal, bright.		
0	3	Shale with stringers of bright coal.		
0	9	Coal, bright banded; with ½ inch shale near top.	796	8
9	0	Shale, carbonaceous, with coal-stringers; quartz grains in basal portion.		
111	0	Shale, grey, sandy; upper 39 feet laminated.	917	9
14	0	Shale, grey and sandy, with inter-bedded sandstone layers.		
0	3	Conglomerate.	932	0
16	9	Rooiberg felsite, white with reddish parts, porphyritic.	948	9

BORE-HOLE 20 BY ZONDER 621 KR

F.R.I. Sample Number	Thickness recovered	Depth		Nature of strata	
	In.	Ft.	In.		
		790	0		
C	5½			Bright coal, pyritic and calcitic.	
	½			Shale.	
	19½			Bright coal, calcitic, with a few thin shale bands. ¾ shale ¾ from bottom.	
B	3½			Shale with bright coal stringers.	
	4			Bright coal, calcitic.	
	3			Shale with coal stringers.	
	2			Shale and coal.	
	3			Bright coal calcitic and slightly pyritic.	
	14			Black shale with a few thin coal bands in top 5"; containing a few scattered quartz grains. Not sampled.	
A	6½			Finely banded bright coal.	Calcitic throughout.
	½			Interbanded calcite and coal.	
	6			Bright coal.	
	3			Shale with stringers of bright coal.	
	9			Bright banded coal with a ½" shale band near top.	
		796	8		

BORE-HOLE 20

F.R.I. Sample Number	Thickness in.		ANALYSIS OF RAW COAL (AIR-DRY BASIS)						Size of Coal Washed
	Exc.	Sam-pled	C.V. lb./lb.	H_2O %	Ash %	V.M. %	Fix. Carb. %	Sw. No.	
54/718C		25½	-	-	20.1	-	-	-	-1"
B	14	15½	-	-	40.7	-	-	-	-1"
A		25	-	-	21.1	-	-	-	-1"

Sample Z

Constitution of Composite Sample.

	Components	Parts
54/718Z	$54/718C_1$	219
	B_1	55
	A_1	211

Description.

73.5% of float
66" of bright
with shale par
over whole sea

D.A

BY ZONDER 621 KR

.G.	Float Yield %	ANALYSIS OF FLOAT(AIR-DRY BASIS) C.V. lb./lb.	H_2O %	Ash %	V.M. %	Fix. Carb. %	Sw. No.	Total Sulphur %	SINK Yield %	Ash %
.58	85.8	12.5	1.9	15.9	35.3	46.9	4½	1.72	14.2	45.6
.58	35.6	11.7	1.8	20.0	33.5	44.7	5	1.46	64.4	52.1
.58	84.5	12.2	1.8	17.7	35.0	45.5	5	1.30	15.5	39.7

	A.F.T.	Total S.
er l gs	Float 1.58: + 1400°C	1.16
	Raw Coal: 1320°C	1.54

Float 1.58 (-20 mesh coal):

Ash	C	H	H_2O
11.0	71.60	4.89	2.6
	82.87	5.66	

BORE-HOLE 21 KALKPAN 683 KR

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
12	0	Sand.		
4	0	Sandstone, weathered.	16	0
275	0	Sandstone, fine-grained, white, pink or red; some well-bedded bands above 142 feet depth; brecciated and silicified at 240 feet depth; much jointed and partly decomposed between 254 and 273 feet; lower 10 feet clayey.	291	3
39	4	Siltstone and marl, white, brown or variegated.	331	0
73		Marl and mudstone alternating with few well-bedded shale layers; purple or mottled.	405	0
48	6	Mudstone, brown, and variegated marl; some sandy shale layers.	464	6
77	10	Mudstone, purple or brown, and variegated marl.		
14	0	Shale, hard, well-bedded, banded in white and purple; a few calcareous nodules.	558	3
62	0	Mudstone, brown; some large calcareous nodules in upper portion.	629	0
68	1	Mudstone, brown or purplish; with several hard, greyish, cherty layers; some clay-pellets and calcareous nodules in central portion.	700	0
39	3	Mudstone, brown with sandy or gritty portions; several intercalated brown to greenish-grey sandstone bands.	741	6
20	0	Sandstone, white, medium-grained, greenish-grey in middle with brown shale layers.		
1	9	Grit.	763	6
3	6	Shale, grey, poorly bedded.		
4	8	Shale, black.	777	6
1	2	Coal, bright banded, and shale, pyritic.		
0	6	Shale. (N.S.)		
0	9	Coal, bright banded, and shale, pyritic.	779	11
3	4	Shale, black, 3 inches coal in middle.	783	3

BORE-HOLE 21 (Cont.)

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In
0	2	Coal, very calcitic and pyritic.		
1	8	Coal, bright banded, very pyritic and calcitic in places.		
0	1½	Shale. (N.S.)		
0	11	Coal, bright banded.	786	3
2	4	Shale, black, with a few coal-stringers.	788	7
0	11	Shale, carbonaceous, with bright coal stringers.	789	6
1	0	Shale. black.		
1	8½	Coal, bright banded, calcitic.		
	3½	Shale. (N.S.)	792	6
6	10	Shale, black, with a few coal-stringers.	799	6
115	0	Shale, grey and sandy, with thin layers of grit and sandstone on some horizons.		
27	8	Sandstone, partly shaly, and grit, mainly greyish, small felsite pebbles in some bands.		
4	4	Grit and conglomerate, grey.		
2	9	Shale, grey and sandy.		
3	5	Sandstone and grit, white.		
0	6	Conglomerate.	954	6
3	0	Rooiberg felsite, porphyritic, decomposed and bleached to white.	957	6

BORE-HOLE 21 KALKPAN 683 KR

F.R.I. Sample Number		Thickness recovered	Depth		Nature of strata
		In.	Ft.	In.	
			777	6	
55/25	D	14			Interbanded bright banded coal and shale, pyritic.
		6			Shale. Not sampled.
	C	9			Interbanded bright banded coal and shale, pyritic.
			779	11	
			783	3	
	B	2			Coal, very calcitic and pyritic.
		20			Bright banded coal, very pyritic and calcitic in places. Core very broken.
	A	1½			Shale. Not sampled.
		11			Bright banded coal.
			786	3	
					NOTE: 1½" of core lost.
			788	7	
		11			Carbonaceous shale with some bright coal streaks. Not sampled.
			789	6	
			790	6	
55/26	A	20½			Bright banded coal, calcitic.
		3½			Shale. Not sampled.
			792	6	

BORE-HOLE 21

F.R.I. Sample Number	Thickness in.		ANALYSIS OF RAW COAL (AIR-DRY BASIS)						Size of Coal Wash
	Exc.	Sampled	C.V. lb./lb.	H_2O %	Ash %	V.M. %	Fix. Carb. %	Sw. No.	
55/25D		14	-	-	31.5	-	-	-	-1"
	6								
C		9	-	-	33.2	-	-	-	-1"
	40								
B		22	-	-	25.6	-	-	-	-1"
A	1½	11	-	-	19.7	-	-	-	-1"
55/26A		20½	-	-	23.4	-	-	-	-1"

KALKPAN 683 KR

S.G.	Float Yield %	ANALYSIS OF FLOAT (AIR-DRY BASIS)						SINK	
		C.V. lb./lb.	H_2O %	Ash %	V.M. %	Fix. Carb. %	Sw. No.	Yield %	Ash %
1.58	51.9	11.1	3.5	23.3	29.9	43.3	1½	48.1	40.4
1.58	49.3	11.6	3.0	19.3	33.8	43.9	3	50.7	46.8
1.58	73.2	11.9	2.5	18.5	34.0	45.0	4-5	26.8	44.9
1.58	95.5	11.9	2.7	18.5	33.2	45.6	4	4.5	44.2
1.58	81.7	11.7	2.7	19.0	33.2	45.1	4½	18.3	43.3

BORE-HOLE 22 BEKEND 690 KR

Thickness recovered Ft.	In.	Nature of strata	Depth Ft.	In.
9	0	Soil.	9	0
2	9	Lateritic soil.		
3	2	Mudstone, purplish-red, weathered.	95	6
42	6	Mudstone and siltstone, weathered.		
15	6	Siltstone, banded white and purple.		
39	8	Mudstone and marl, purple, reddish-brown and variegated; three cherty layers at base and in the middle; sandy layer near bottom.	220	0
14	4	Grit and sandstone, brown.	235	0
42	9	Mudstone, grey, purple, brown or yellow.		
2	3	Dolerite, fine-grained.		
11	2	Mudstone, grey, black at base.	303	6
1	1	Dolerite, fine-grained.		
4	9	Shale, black, with greyish-green band in middle.		
5	3	Dolerite, fine-grained.		
6	6	Mudstone, grey-green.		
1	1	Dolerite with much pyrite, fine-grained.		
12	11	Mudstone, grey.	349	0
0	8	Shale, carbonaceous.		
0	2½	Coal, dull and shaly.(N.S.)		
1	8½	Coal, mixed bright and dull, pyritic.	351	7
5	0	Shale, black, with a few coal-layers.	357	0
3	6	Dolerite, fine-grained. Brecciated and pyritic on contacts.	360	8
9	5	Shale, black, with a few coal-stringers.	372	6
0	5½	Coal, dull.		
1	1½	Coal, dull and shaly with occasional bright coal-stringers in bottom half.		
0	3½	Coal, bright.		
0	2½	Shale and bright coal interbanded with large pyritic nodules.		
0	½	Coal, bright.[+]	374	6
0	9	Shale, black; a few coal-stringers in it; sandy in lower 6 inches.	378	3

[+] 1½ inch core too much

BORE-HOLE 22 (Cont.)

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
112	9	Shale, sandy, grey; some thin sandstone layers. The least sandy portions are poorly bedded.	491	0
13	0	Dolerite, fine-grained.		
5	6	Shale, hard, grey.		
123	0	Dolerite, coarse-grained, decomposed along numerous joints. Fine-grained chill-phases.	632	6
7	6	Shale, greyish-black, slightly sandy.	640	0

BORE-HOLE 22 BEKEND 690 KR

F.R.I. Sample Number	Thickness recovered	Depth		Nature of strata
	In.	Ft.	In.	
		349	0	
B	8			Carbonaceous shale. Not sampled.
	2½			Dull shaly coal. Not sampled.
	20½			Mixed dull and bright coal. Pyritic.
		351	7	
		372	6	
A	5½			Dull coal.
	13½			Dull shaly coal with occasional bright coal-stringers in bottom half.
	3½			Bright coal.
	2½			Interbanded shale and bright coal with large pyritic nodules.
	½			Bright coal.
		374	6	

NOTE:- 1½" of core too much.

BORE-HOLE 22

F.R.I. Sample Number	Thickness in.		ANALYSIS OF RAW COAL (AIR-DRY BASIS)						S C W
	Exc.	Sampled	C.V. lb./lb.	H_2O %	Ash %	V.M. %	Fix. Carb. %	Sw. No.	
55/176B		20½	–	–	18.4	–	–	–	–
A		25½	–	–	37.4	–	–	–	–

BEKEND 690 KR

e l hed	S.G.	Float Yield %	ANALYSIS OF FLOAT (AIR-DRY BASIS)						SINK	
			C.V. lb./lb.	H_2O %	Ash %	V.M. %	Fix. Carb. %	Sw. No.	Yield %	Ash %
	1.58	93.7	11.8	3.3	17.4	23.5	55.8	P	6.3	32.5
	1.58	48.3	10.5	3.4	25.7	23.0	47.9	P	51.7	48.3

BORE-HOLE 23 WELTEVREDE 670 KS

Thickness recovered Ft.	In.	Nature of strata	Depth Ft.	In.
2	0	Soil.		
11	0	Surface-limestone.		
35	6	Red Beds, much weathered.	48	6
2	10	Grit, partly clayey, brown to white.		
2	3	Mudstone or shale, purple or brown.		
8	5	Grit, brown or white; with two shale partings.	62	0
46	3	Mudstone, soft, purple, brown or grey with yellow spots.		
27	5	Mudstone, grey and yellow mottled.	172	0
5	7	Shale, grey to black.		
1	5	Shale, carbonaceous, with bright coal-stringers.	179	3
2	7	Coal, bright, with several thin carbonaceous shale bands, especially towards top, shaly in bottom 1½ inches; some slip-planes; calcitic and pyritic.	183	3
3	11	Shale, black, with bright coal-stringers.	187	2
0	2½	Coal, bright, and shale interbanded.		
0	3	Coal, bright, shaly.		
0	3½	Shale, carbonaceous, with bright coal-stringers.		
0	5	Coal, bright, with an occasional thin carbonaceous shale band, pyritic.	188	4
1	6	Shale with bright coal-stringers.		
62	6	Shale, sandy and well-bedded, with thin sandstone bands. Much calcite at 237 feet depth.		
118	11	Shale, grey and sandy, alternating with grey shaly sandstone.		
0	11	Quartzite pebble, white.		
16	8	Sandstone, grey and shaly, with scattered small pebbles; and sandy grey shale.	395	0
8	0	Conglomerate: angular to rounded pebbles of red, medium-grained, quartzite in a grey, clayey matrix.	403	0

BORE-HOLE 23 WELTEVREDE 670 KS

F.R.I. Sample Number	Thickness recovered	Depth		Nature of strata	
	In.	Ft.	In.		
		179	3		
C	17			Carbonaceous shale with a little bright coal.	
B	31			Bright coal with several thin carbonaceous shale bands, especially towards top, shaly in bottom 1½ inches; occasional slipplanes; calcitic and pyritic.	
		183	3		
		187	2		
	2½			Interbanded shale and bright coal.	Not Sampled
	3			Bright, coal, shaly.	
	3½			Carbonaceous shale with bright coal-stringers.	
A	5			Bright coal with an occasional thin carbonaceous shale band, pyritic.	
		188	4		

BORE-HOLE 23

F.R.I. Sample Number	Thickness in.		ANALYSIS OF RAW COAL (AIR-DRY BASIS)						Si c Co Wa
	Exc.	Sam-pled	C.V. lb./lb.	H_2O %	Ash %	V.M. %	Fix. Carb. %	Sw. No.	
55/249C		17	-	-	33.8	-	-	-	-1
B		31	-	-	30.8	-	-	-	-1
	56								
A		5	-	2.5	21.9	31.4	44.2	2	-

WELTEVREDE 670 KS

e l ned	S.G.	Float Yield %	ANALYSIS OF FLOAT (AIR-DRY BASIS)						SINK	
			C.V. lb./lb.	H_2O %	Ash %	V.M. %	Fix. Carb. %	Sw. No.	Yield %	Ash %
	1.58	58.1	10.0	2.6	29.9	28.3	39.2	2	41.9	44.1
	1.58	79.5	10.6	2.6	27.0	28.1	42.3	2½	20.5	45.3
	-	-	-	-	-	-	-	-	-	-

BORE-HOLE 24 WELGEGUND 693 KS

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
3	0	Soil.		
45	0	Surface-limestone and weathered rock.		
6	0	Mudstone, reddish-brown, weathered.	54	0
5	0	Grit, clayey.		
10		Mudstone with some gritty layers, reddish-brown to pink; grades into clayey sandstone.	80	0
17	9	Conglomerate: angular and rounded pebbles of medium-grained red quartzite, diabase, shale and grey quartzite in a clayey sandstone matrix.	97	9
8	6	Shale and mudstone, sandy, buff; grains and small pebbles of red quartzite are scattered throughout it.	110	0
10	6	Conglomerate: boulders of red, medium-grained quartzite in brownish-red clayey matrix.	135	0

BORE-HOLE 25 BOUW LUST 660 KS

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
13	0	Soil and surface-limestone.		
47	0	Shale, weathered.	60	0
10	6	Shale, grey and sandy, alternating with shaly sandstone; some gritty layers in latter.	78	6
13	9	Grit and sandstone with interbedded shale layers.	92	3
0	2	Coal, with pyrite nodules.		
3	5	Shale, carbonaceous, with coal-stringers.	97	0
0	11	Coal, mainly dull and shaly.	97	11
8	6	Shale, carbonaceous, with occasional shaly coal-bands and occasional large pyritic nodules (N.S.).	106	5
1	3	Shale, carbonaceous with one coal-lens.		
1	5	Shale, grey and sandy, some black layers.		

BORE-HOLE 25 (Cont.)

Thickness recovered Ft.	In.	Nature of strata	Depth Ft.	In.
0	6	Shale, carbonaceous.		
11	3	Grit, shaly sandstone, and grey sandy shale in alternating layers.	120	10
7	11	Shale, black.	128	9
3	1	Sandstone and grey, sandy shale.		
5	2	Grit, grading into conglomerate.	137	0
10	1	Sandstone, grey, clayey, fine-grained.		
2	9	Grit and conglomerate.	149	10
92	0	Quartzite, greenish-grey, well-bedded and cross-bedded on several horizons. Dip 30°.(Pretoria Series).	242	0

BORE-HOLE 25 BOUW LUST 660 KS

F.R.I. Sample Number		Thickness Recovered	Depth		Nature of strata
		In.	Ft.	In.	
			96	9	
		3			Carbonaceous shale. Not sampled.
55/366	A	11			Mainly dull shaly coal.
		102			Carbonaceous shale with occasional shaly coal-bands and occasional large pyritic nodules. Not sampled.
			106	5	

BORE-HOLE 25 BOUW LUST 660 KS

F.R.I. Sample Number	Thickness in.		ANALYSIS OF RAW COAL (AIR-DRY BASIS)						
	Exc.	Sampled	C.V. lb./lb.	H_2O %	Ash %	V.M. %	Fix. Carb. %	Sw. No.	Total Sulphur %
55/366A		11	-	2.0	37.0	19.3	41.7	P	-

BORE-HOLE 26 BOMMERSHOK VAN CONTERBERG 665 KS

Thickness recovered Ft.	In.	Nature of strata	Depth Ft	In.
66	0	Soil and surface-limestone.	66	0
74	0	Mudstone, reddish, sandy.	140	0
139	10	Mudstone, grey to blackish.	279	10
108	9	Dolerite.	388	5
39	6	Mudstone with sandstone bands.	427	11
16	3	Sandstone, grey, medium-grained.	444	2
25	9	Shale, black, with some sandstone bands.	469	11
12	6	Sandstone, gritty, grey.	482	5
2	10	Conglomerate.	485	3
19	9	Sandstone (Loskop System).	505	0

BORE-HOLE 27 HULPFONTEIN 549 KS

Thickness recovered Ft.	In.	Nature of strata	Depth Ft.	In.
15	0	Soil and weathered basalt.	15	0
844	4	Basalt: alternating layers of amygdaloidal and massive lava, generally greenish-black in colour with a few brownish bands; tuff at depth of 575 feet.	859	4
2	7	Sandstone, pink with green markings, fine-grained and massive.	861	11
343	10	Basalt: alternating layers of amygdaloidal and massive lava, generally greenish-black with some brown bands.	1205	9
0	6	Tuff: fine-grained ground-mass containing angular pieces of brown rock.		
0	4	Shale, soft, sandy, brown.	1206	7
26	9	Sandstone, white, fine-grained, with two partings of brown or grey shale.	1233	4
0	3	Shale or tuff, greyish-black.		
8	10	Sandstone, white, fine-grained.	1242	5
1	2	Shale or tuff, greyish-black.	1243	7
10	4	Sandstone, white, fine-grained, in upper portion a few stringers of zeolite with black hydrocarbon.	1253	11
249	8	Sandstone, brown, fine-grained, portions very friable.	1503	7

BORE-HOLE 27 (Cont.)

Thickness recovered		Nature of strata	Depth	
Ft.	In.		Ft.	In.
3	8	Sandstone, purple, fine-grained, becomes clayey towards bottom.	1507	3
177	4	Mudstone, siltstone and marl in alternating bands, brown to white.	1684	7
1	10	Clay-pellet conglomerate.	1686	5
4	4	Marl.	1690	9
103	8	Mudstone red or brown, with layers of marl.	1794	5
7	7	Sandstone, coarse-grained, white to light brown.	1802	0
23	0	Sandstone and grit, brown and white.	1825	0
33	0	Mudstone, buff to brown.	1858	0
0	4	Shale, carbonaceous.		
0	7	Coal, bright, with fine shaly bands; calcitic; vertical intrusive in coal. (N.S.)		
2	6½	Shale, carbonaceous.	1861	9
0	6	Shale, carbonaceous, with some highly pyritic and calcitic bright coal towards bottom. (N.S.)		
0	10	Coal, bright, finely interbanded with shaly bands; slightly calcitic and pyritic.		
0	3	Shale, carbonaceous, with a few thin bright coal-stringers towards top. (N.S.)	1863	4
3	5	Shale, carbonaceous.	1866	9
0	3	Coal, mainly bright, highly pyritic and calcitic. (N.S.)		
1	1	Coal, finely bright banded, duller bands shaly; highly calcitic in top half; large vertical pyrite inclusions.		
2	0½	Coal, finely bright banded; slightly calcitic and pyritic.		
0	2½	Shale, carbonaceous.	1870	4
14	2	Shale, black.	1884	6
2	6	Sandstone, micaceous, fine-grained, bottom portion banded.	1887	0
25	0	Sandstone, white, fine-grained.	1912	0
68	10	Shale, sandy.	1980	10
18	7	Sandstone, partly gritty, with intercalated sandy shale.	1999	5
8	0	Shale, sandy, black, friable...	2007	5

BORE-HOLE 27 (Cont.)

Thickness recovered Ft.	In.	Nature of strata	Depth Ft.	In.
18	7	Sandstone, fine-grained, grey to greyish-black.	2026	0
0	8	Shale, carbonaceous.		
5	6	Grit: quartz pebbles in places.	2032	2
0	8	Shale, carbonaceous.	2032	10
40	2	Sandstone, coarse to fine-grained, brown or blackish-grey.	2073	0
7	0	Shale, black.	2086	0
20	0	Shale, sandy.	2106	0
54	6	Conglomerate: boulders up to 14 inches in diameter in brown matrix.	2161	6
29	6	Shale, greyish. Dip 15°. (Loskop System)	2191	0

BORE-HOLE 27 HULPFONTEIN 549 KS

F.R.I. Sample Number		Thickness recovered	Depth		Nature of strata
		In.	Ft.	In.	
			1858	0	
		4			Carbonaceous shale. Not Sampled
		7			Bright coal with fine shaly bands. Calcitic. Vertical intrusive practically over full length of section; apparently intruded in middle of section as banding of coal is deflected upwards towards top and downwards towards bottom. Not Sampled.
		3½			Carbonaceous shale. Not Sampled.
			1859	6	
			1861	9	
		6			Carbonaceous shale with some highly pyritic and calcitic bright coal towards bottom. Not Sampled.
57/301	C	10			Bright coal, finely interbanded with shaly bands. Slightly calcitic and pyritic.
		3			Carbonaceous shale with a few thin bright coal bands towards top. Not Sampled.
			1863	4	
			1866	6	
		3			Carbonaceous shale. Not Sampled.
		3			Mainly bright coal, highly pyritic. Pyrite horizontally and vertically disposed.

BORE-HOLE 27 (Cont.) HULPFONTEIN 549 KS

F.R.I. Sample Number		Thickness recovered	Depth		Nature of strata
		In	Ft.	In.	
			1866	6	Highly calcitic. Not Sampled.
57/301	B	13			Finely banded bright coal; duller bands probably shaly. Large vertical localised pyrite inclusions thinning out towards bottom. Highly calcitic in top half.
	A	24½			Finely banded bright coal. Slightly pyritic and calcitic. No obvious shaly bands.
		2½			Carbonaceous shale. Not Sampled.
			1870	4	

BORE-HOLE 27

F.R.I. Sample Number	Thickness in.		ANALYSIS OF RAW COAL (AIR-DRY BASIS)					
	Exc.	Sampled	C.V. lb./lb.	H_2O %	Ash %	V.M. %	Fix. Carb. %	Sw. No.
57/301C	47	10	-	1.7	22.1	31.5	44.7	4½
B		13	-	-	37.9	-	-	-
A		24½	-	-	15.7	-	-	-

HULPFONTEIN 549 KS

ize of oal ashed	S.G.	Float Yield %	ANALYSIS OF FLOAT (AIR-DRY BASIS)						SINK	
			C.V. lb./lb.	H_2O %	Ash %	V.M. %	Fix. Carb. %	Sw. No.	Yield %	Ash %
½"	1.45	42.3	13.1	1.6	14.9	34.3	49.2	7½	57.7	54.8
s ecei- ed.	1.45	88.1	13.2	1.7	14.3	33.7	50.3	8½	11.9	25.7

DIE STEENKOOLVELD VAN DIE NOORDOOSTELIKE SPRINGBOKVLAKTE STATE VAN BOORGATE 1 TOT 27, VIR DIE DEPARTEMENT MYNWESE GEBOOR.

OPSOMMING IN AFRIKAANS

GEOLOGIE [+]

In die noordoostelike gedeelte van die Springbokvlakte is tussen 1952 en 1957 27 gate vir die Geologiese Opname geboor. Vanaf 1952 tot 1955 is ŉ aansienlike gedeelte van Gebied 17 met behulp van lugfoto's gekarteer. Hierdie werk was bedoel om die voorkoms, aard en verspreiding van steenkool te ondersoek. Die meegaande kaart is saamgestel uit die nuwe werk in Gebied 17, onlangse werk in Gebied 7, waar daar ook vier gate geboor is, en gedeeltelik uit die reeds bestaande kaarte van bogenoemde twee gebiede.

Die gebied is grotendeels ŉ gelyk vlakte met ŉ hoogte van oor die 3,000 voet bo seespieël en feitlik geen dreinering nie. Groot gedeeltes van die oorspronklike bosbedekkings is verwyder om landerye aan te lê.

Die vloer van die Sisteem Karoo is taamlik ongelyk en bestaan hoofsaaklik uit die Bosveldstollingskompleks en die Sisteme Transvaal, Loskop en Waterberg. Die Karoogesteentes is oor ŉ groot oppervlakte bedek deur sand, swart en bruin turf, wit tot rooi grond, puin, alluvium, riviergruis, lateriet, oppervlakkalksteen en attapulgiet.

Die volgende Karoogesteentes kom in die gebied voor:

[+] Deur H.N. Visser

Afdeling van Sisteem	Aard van lae	Dikte
Etage Drakensberg	Amandelhoudende en massiewe basalt met sporadiese piroklaste en plek-plek n sandsteenlaag.	1206 voet
Etage Holkranssandsteen	Fynkorrelrige, massiewe sowel as goedgelaagde sandsteen met ondergeskikte skalieagtige lagies.	86 tot 394 voet
Etage Rooilae	Helderkleurige sliksteen, moddersteen en merrel met ondergeskikte grintsteen en kleipilkonglomeraat.	31 tot 409 voet
Etage Molteno	Sandsteen en grintsteen met skalie- en moddersteenlae.	0 tot 70 voet
Serie Beaufort	Bruin en vaal moddersteen en skalie met enkele sanderige lae.	30 tot 126 voet
Etage Bo-Ecca	Swart skalie en steenkool heel bo plek-plek.	0 tot 50 voet
	Vaal sanderige skalie en skalieagtige sandsteen.	95 tot 190 voet
Etage Middel-Ecca	Sand- en grintsteen, skalie en konglomeraat met swart skalie en matkool plek-plek naby die basis.	0 tot 137 voet
Serie Dwyka	Konglomeraat en of tilliet met moddersteenlense.	0 tot 100 voet.

Dolerietgange is baie skaars in die Karoogesteentes. Een plaat, waarvan die stand wissel van konkordant tot transgressief, kom voor in die suidoostelike gedeelte van die Karookom. Dit is van 36 tot 165 voet dik en is plek-plek in verskeie dele opgesplits.

Die korrelasie van die Karoogesteentes is alleen op litologie gebaseer. Slegs in die gevalle van die Serie Beaufort en die Etage Molteno bestaan daar n mate van twyfel omtrent die korrelasie, en die indeling van die Serie Ecca in die boonste en middelste étages is ook nie volkome seker nie.

Die Sisteem Karoo is afgeset op ŉ taamlik ongelyk landskap met heuwelagtige terrein na die noorde- en noordwestekant van die bekken. Teen laasgenoemde kante van die Karookom oorvleuel die boonste afdelings van die sisteem die onderstes, wat swak of glad nie ontwikkel is nie. Die Karoogesteentes vorm twee baie vlak, langwerpige komme of sinklinale buigings met ŉ plat antiklinale buiging tussen hulle. Hierdie regionale strukture verloop van suidwes na noordoos. Hulle is in ŉ mate gewysig deur verskeie afskuiwings met naastenby dieselfde strekking.

Met die boordery is bewys dat steenkool op twee horisonte in die Serie Ecca voorkom, maar dat albei koolsones net plek-plek ontwikkel is. Naby die basis van die Etage Middel-Ecca kom koolstofhoudende skalie en skalieagtige matkool voor. Dit is slegs tussen Bouw Lust 660 KS en Madras 566 goed ontwikkel, en ook hier is dit van geen ekonomiese waarde nie.

Die ander koolsone word aangetref aan die top van die Etage Bo-Ecca. Dit bestaan uit koolstofhoudende skalie met verskeie lae glanskool wat van paar duim tot verskeie voet dik is. Die glanskool bevat heelwat fyn skalielagies en gradeer na skalieagtige kool. Die gegewens is nog te karig om die koollae te korreleer en om reserwes uit te werk.

Slegs twee klein gebiede van sowat 125 vierkante myl is van moontlike waarde as koolvelde en dien verder ondersoek te word; albei bevat net Bo-Eccasteenkool. Die een is weerskante van die treinspoor na Zebediela in die omgewing van Roedtan geleë. Hier is die koolsone van 19 tot 36 voet dik en kom voor op dieptes van 100 tot 1875 voet. Die ander lê rondom Nutfield-sylyn weerskante van die spoorlyn na Marble Hall, en hier is die koolsone van 18 tot 36 voet dik en is aangetref op dieptes van 100 tot 800 voet.

CHEMIESE EN FISIESE EIENSKAPPE VAN DIE STEENKOOL [+]

Die meeste steenkoollae van hierdie gebied is taamlik dun en kom voor op groot dieptes onder die oppervlakte. Hulle het meestal uit glanskool met hoë vlugstofgehalte en goed ontwikkelde sweleienskappe bestaan en is soortgelyk aan die glanskoollae van die Waterbergse steenkoolveld. Omdat die steenkool tussengelaag is met dun skalielagies, het die lae 'n hoë asgehalte en 'n produk met 'n redelike lae asgehalte kan nie deur middel van 'n wasproses verkry word tensy die steenkool fyn vergruis word nie. Die hoë vlugstofgehalte van die steenkool sou meebring dat, by verkooksing, 'n kooks verkry word wat bros en vingeragtig is.

In slegs drie boorgate is lae van 4 voet of dikker aangetref. Gemiddelde analises van hierdie lae word hieronder aangegee:

[+] Deur S.W. van der Merwe

Boorgat	1		20	23
Steenkooldikte (dm.)	66		66	48
Uitsluitsels (dm.)	-		14	-
Roukoolas (%)	29.9		25.3	32.6
Dryfstof by s.g.	1.50		1.58	1.58
Steenkoolgrootte (dm.)	-1	-3/16	-1	-1
Opbrengs (%)	31.2	41.7	73.5	71.9
Verhittingswaarde (lb./lb.)	12.4	12.8	12.3	10.4
Vog (%)	2.1	2.1	1.8	2.6
As (%)	14.5	11.8	17.2	27.8
Vlugstowwe (%)	36.4	37.0	35.0	28.2
Swelsyfer	4½	5½	5	2-2½

Hierbenewens is slegs in drie ander boorgate lae van noemenswaardige betekenis aangetref, naamlik:

Boorgat	3	21	27
Steenkooldikte (dm.)	34	33	37½
Uitsluitsels (dm.)	-	1½	-
Roukoolas (%)	21.8	23.6	23.4